

Course guides

250667 - VALAMBMACO - Integrated Environmental Assessment of Building Materials

Last modified: 06/10/2020

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2014). (Optional subject).
Academic year: 2020 **ECTS Credits:** 5.0 **Languages:** Spanish, English

LECTURER

Coordinating lecturer: MIREN ETXEBERRIA LARRAÑAGA

Others: MIREN ETXEBERRIA LARRAÑAGA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

13340. Apply scientific concepts to environmental problems and their correlation with technological concepts.
13347. Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

TEACHING METHODOLOGY

The course consists of 3 hours per week of classes in the classroom (large group).

During the theoretical lectures, the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises. The practical sessions are devoted to solving practical problems and real cases with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

LEARNING OBJECTIVES OF THE SUBJECT

CE01 - Apply scientific concepts to environmental problems and their correlation with technological concepts.

CE08-Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Explore scientific concepts and technical principles of quality management of the receiving means, atmosphere, water and soil, and applied to problem solving.

Explore scientific concepts and technical principles of management and treatment of gaseous emissions, water supply, sewage and waste and remediation techniques for groundwater and contaminated soils.

Sized systems for the treatment of major pollutants vectors in specific sectors of activity.

Interprets rules, identifies goals, assesses technical alternatives proposed unconventional solutions and priority actions.

Construction products. Historical development of characteristic materials.

Procedures for demolition and use of waste materials.

Deconstruction, separation and pretreatments.

Identification, characterization and utilization of waste from demolition and deconstruction.

Use in fillings, as aggregates in concrete and asphalt mixes.

Other industrial uses. Precast.

Environmental Assessment.

Leaching. Essays and limits.

Practical examples of application.

Give the student a broad and precise vision of the methodological framework for evaluating the environmental impact of different construction materials. Analyze the assessment of applicable waste as resources in the manufacture of construction materials. Provide tools to establish valuation strategies for different materials by solving cases.

STUDY LOAD

Type	Hours	Percentage
Hours small group	10,0	8.00
Hours medium group	10,0	8.00
Self study	80,0	64.00
Hours large group	15,0	12.00
Guided activities	10,0	8.00

Total learning time: 125 h

CONTENTS

Chapter 1. Introduction

Description:

Introduction to the course. Comment an introductory reading

Types of scientific papers. Structure and analysis. Quality parameters of the research. Literature searches.

Specific objectives:

To inform students about the development of the course

To distinguish different types of scientific documents and their structure. To learn to carry out literature searches. To know the parameters that indicate the quality of a scientific paper.

Full-or-part-time: 7h 11m

Theory classes: 3h

Self study : 4h 11m

Chapter 2. Leaching

Description:

Definition. Leaching mechanisms and factors controlling leaching. Leaching scenarios.

Types of tests. Operational aspects. Applicability. Quality control.

Problems on leaching tests.

Interpretation of the results obtained through a leaching test.

Specific objectives:

To know the characteristics of the leaching phenomena in construction and building materials.

To know the different laboratory tests used to evaluate the leaching process of a material.

To learn how to transform and use the data obtained from a leaching test.

To learn how to relate the data obtained in the laboratory with real case situations of application of a material.

Full-or-part-time: 13h 12m

Theory classes: 1h 30m

Practical classes: 2h 30m

Laboratory classes: 1h 30m

Self study : 7h 42m

Chapter 3. Use of industrial waste in construction materials

Description:

Classification of industrial waste. Granular and powder.

Analysis of applications of granular waste as well as powder waste at the laboratory and real scale.

Specific objectives:

Make a brief analysis of the characteristics that each type of waste present, with respect to their chemical composition (possible leaching problems) and their physical and mechanical properties.

Know and have criteria to design and validate the use of waste in materials.

Full-or-part-time: 16h 48m

Theory classes: 2h 30m

Practical classes: 2h 30m

Laboratory classes: 2h

Self study : 9h 48m

Chapter 4. Utilization of waste in construction materials

Description:

Types of existing construction waste. Treatments and characteristics

Use as filler, aggregate i concrete and asphalt binders. Other industrial uses. Precast products.

Specific objectives:

To Know what types of waste material are produced and their characteristics

To know the main applications of wastes in construction

Full-or-part-time: 15h 36m

Theory classes: 2h

Practical classes: 2h 30m

Laboratory classes: 2h

Self study : 9h 06m

Chapter 5. 69/5000 Utilization of dredging waste, sediment, plastics in materials

Description:

Describe the types of residues and their physico-chemical characteristics
Procedures of obtaining. Identification, characterization and use of waste. Treatments
Some Real cases will be described as well as laboratory work

Specific objectives:

Know the types of waste and their properties
Know Treatments to be used in different applications
To know alternative materials

Full-or-part-time: 14h 23m

Theory classes: 2h
Practical classes: 2h
Laboratory classes: 2h
Self study : 8h 23m

Chapter 6. Environmental Impact Assessment. Low embodied carbon material

Description:

The calculation basis of the carbon incorporated in materials
Assess the actual cases carried out
Choose a case and analyze

Specific objectives:

Know the built-in carbon of classic building materials and alternative materials
Know the case studies performed
To know the practice

Full-or-part-time: 16h 48m

Theory classes: 3h 30m
Practical classes: 1h 30m
Laboratory classes: 2h
Self study : 9h 48m

GRADING SYSTEM

The qualification of the subject is obtained from the qualifications of the continuous evaluation (80%) and those corresponding to the tests of evaluation of theoretical concepts (20%).

The continuous evaluation consists of the realization of different activities and laboratory practices, both individual and group, of an additive and formative nature, made during the course (inside and outside the classroom).

The evaluation tests consist of questions about concepts associated with the learning objectives of the subject in terms of knowledge or understanding, and a set of application exercises.

EXAMINATION RULES.

80% assistance.

Delivering of all activities and laboratory works of the continuous assessment.

BIBLIOGRAPHY

Basic:

- Van der Sloot, H.A.; Dijkstra, J.J. Development of horizontally standardized leaching tests for construction materials: a material or release based approach? Identical leaching mechanisms for different materials [on line]. ECN, Petten, 2004 [Consultation: 24/02/2021]. Available on: <http://resolver.tudelft.nl/uuid:ad1b6b78-18c7-4b7f-82b4-5c45842c74ea>.
- Dijkstra, J.J.; Van der Sloot, H.A.; Spanka, G.; Thielen, G. How to judge release of dangerous substances from construction products to soil and groundwater [on line]. 2005 [Consultation: 24/02/2021]. Available on: <http://resolver.tudelft.nl/uuid:41601e06-aef1-40e0-9119-1cb228184359>.
- Kosson, D.S.; van der Sloot, H.A.; Sanchez, F.; Garrabrants, A.C. "An integrated framework for evaluating leaching in waste management and utilization of secondary materials". Environmental Engineering Science [on line]. vol. 19, num. 3, may 2002, pp. 159-204 [Consultation: 24/02/2021]. Available on: https://www.researchgate.net/publication/228786988_An_Integrated_Framework_for_Evaluating_Leaching_in_Waste_Management_and_Utilization_of_Secondary_Materials.

Complementary:

- Van der Sloot, H.A.; Heasman, L.; Quevauviller, Ph. Harmonization of leaching/extraction tests. Amsterdam: Elsevier, 1997. ISBN 0444828087.
- Pacheco-Torgal, F. [et al.] (eds.). Advances in construction and demolition waste recycling: management, processing and environmental assessment. Duxford, UK: Woodhead Publishing, 2020. ISBN 9780128190555.